4 - Sensor

Gradiometer (GSM-19GW4 v7.0)

NEW!

Our World is **Magnetic.**

GEM's unique Overhauser system combines data quality, survey efficiency and options into an instrument that matches costlier optically pumped caesium capabilities.

And the latest v7.0 technology upgrades provide even more value:

Integrated GPS option
<1.5m standard GPS for high resolution surveying
<1.0m OmniStar GPS
<0.7m for newly introduced CDGPS

25% increase in sensitivity over GEM's v6.0 system

Enhanced memory (increased by 32 times to 32 MB standard)

Programmable base station (for scheduling base stations in one of three modes)

Optional DGPS real-time and post-time processing (for metre to sub-metre positioning accuracy)

Rapid data transfer (using the advanced GEMLinkW software)

And all of these technologies come complete with the most attractive prices and warranty in the business!

Multi-sensor configurations can be implemented on various platforms. These platforms take advantage of GEM's 4-channel "true simultaneous" capabilities

The GSM-19 v7.0 Overhauser instrument is the heart of GEM's unique 4 Sensor gradient magnetometer -- representing a unique blend of physics, data quality, operational efficiency, system design and options that clearly differentiate it from other quantum magnetometers.

With data quality exceeding standard proton precession and comparable to costlier optically pumped cesium units, the GSM-19 is a standard (or emerging standard) in many fields, including:

* Mineral exploration (ground and airborne base station)

* Environmental and engineering

* Pipeline mapping

* Unexploded Ordnance Detection

* Archeology

* Magnetic observatory measurements

* Volcanology and earthquake prediction

Taking Advantage of the Overhauser Effect

Overhauser effect magnetometers are essentially proton precession devices -- except that they produce an order-of-magnitude greater sensitivity. These "supercharged" quantum magnetometers also deliver high absolute accuracy, rapid cycling (up to 5 readings / second), and exceptionally low power consumption.

The Overhauser effect occurs when a special liquid (with unpaired electrons) is combined with hydrogen atoms and then exposed to secondary polarization from a radio frequency (RF) magnetic field.

The unpaired electrons transfer their stronger polarization to hydrogen atoms, thereby generating a strong precession signal -- that is ideal for very high-sensitivity total field measurements.

In comparison with proton precession methods, RF signal generation also keeps power consumption to an absolute minimum and eliminates noise (i.e. generating RF frequencies are well out of the bandwidth of the precession signal).

In addition, polarization and signal measurement can occur simultaneously -- which enables faster, sequential measurements. This, in turn, facilitates advanced statistical averaging over the sampling period and/or increased cycling rates (i.e. sampling speeds).

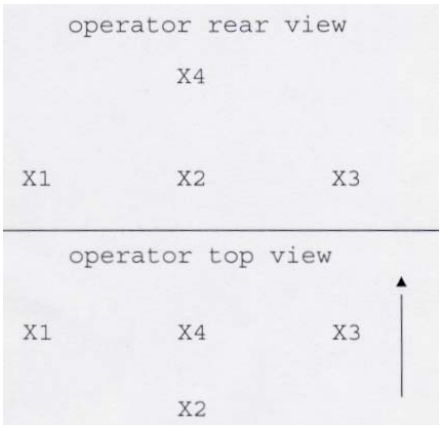
These advantages, combined with the use of 4 precisely timed, highly accurate sensors, provides a measuring system that is without comparison in the industry.

Configurations

Key components that differentiate the GSM-19GW4 from other systems on the market include the sensor and data acquisition console. Specifications for components are provided on the right side of this page. In addition, the GSM-19GW4 can be configured in one of two arrays: 3D and Planar.

3D Configuration

With the 3D configuration, sensors are arranged in a "wedge-type" array with a leading (or trailing) sensor that is on a different elevation than the other sensors. The following diagram shows this configuration.



Sensor X4 is located at a different level than the other sensors in order to derive the 3D vertical gradient. Output values are determined automatically using the GEM system console.

This image of a cart-borne system shows the 3D array in operation. Note that an external GPS is also provided for highly

GEM's dIdD employs a mutually orthogonal coil system that measures one unbiased and four biased values of the total magnetic field. The coils are oriented to be perpendicular to the Earth's magnetic field vector, F (i.e. one coil is in the horizontal plane and one coil is in the vertical geomagnetic meridian plane).

Equal and opposite deflection currents are introduced sequentially in the Inclination (I) coil (i.e. oriented perpendicular to F). The resultant deflected values of F in the geomagnetic meridian plane are called the Ip and Im values. The Potassium magnetometer records these values as well as the undeflected value.

Then, equal and opposite currents are sequentially introduced into the Declination coil (D) which is also perpendicular to F. The resultant deflected values of F in the geomagnetic East - West direction are called the Dp and Dm values. The Potassium magnetometer records these values as well as the undeflected value.

A simple algorithm determines the subsequent instantaneous angular changes of the direction of the Earth's vector, F. These angular changes are dI and dD.

Adding dI and dD to baseline values of Inclination and Declination gives instantaneous Inclination and Declination values for F. (Baseline values are determined from absolute measurement.)

Data Acquisition & Display Software

GEM's custom data acquisition and display software is a Windows interactive interface. The software saves the calculated values to a disk file and displays the values in text and graph modes for easy monitoring of system functions.

The dIdD analog display charts the incoming data versus time. Separate charts show Total Field, East, North and Vertical components. Inclination and Declination charts are shown in graphical windows displayed below these values.

Specifications

Performance

Sensitivity: 0.022 nT / √Hz
Resolution: 0.01 nT
Absolute Accuracy: +/- 0.1 nT
Range: 15,000 to 120,000 nT
Gradient Tolerance: < 10,000 nT/m
Samples at: 60+, 5, 3, 2, 1, 0.5, 0.2 sec
Operating Temperature: -40C to +50C

Operating Modes

Manual: coordinates, time, date and reading stored automatically at minimum 3 sec. interval
Base Station: time, date and reading stored at 3 to 60 second intervals
Remote Control: Control: optional remote control using RS-232 interface
Input / Output: RS-232 or analog (optional) output using 6-pin weatherproof connector

Storage - 32 MB (# of Readings)

Mobile: 1,198,372
# of readings assumes 4 fields with 4 bytes per field plus 8 bytes for GPS and 4 bytes for time value

Dimensions

Console: 223 x 69 x 240 mm
Sensor: 175 x 75mm diameter cylinder

Weights

Console with Belt: 2.1 kg
Sensor and Staff Assembly: 1.0 kg

Standard Components

GSM-19 console, GEMLinkW software, batteries, harness, charger, 4 sensors with cable, RS-232 cable, staff, instruction manual and shipping case.

Optional VLF

Frequency Range: Up to 3 stations between 15 to 30.0 kHz
Parameters: Vertical in-phase and out-of-phase components as % of total field. 2 components of horizontal field amplitude and total field strength in pT.

Resolution: 0.1% of total field

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01/08/2008